

A bird survey of the Ruvuma Delta, northern Mozambique

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Un inventaire ornithologique du Delta de la Ruvuma, Mozambique du nord. Sont présentés ici les résultats d'un inventaire ornithologique réalisé en mai 2008 dans la partie mozambicaine du Delta de la Ruvuma, Région de Cabo Delgado. Au total, 146 espèces d'oiseaux ont été recensées, dont neuf individus du Crabier blanc *Ardeola idae*, classé comme Menacé d'extinction, et huit des 25 espèces confinées au biome côtier est africain connues du Mozambique. Malgré le fait que le Delta de la Ruvuma soit encore relativement bien préservé, il est gravement menacé par l'expansion rapide de l'agriculture, la chasse, l'exploitation projetée du pétrole et du gaz, et l'extraction illégale du bois. Les auteurs proposent qu'une partie des revenus potentiellement énormes qui vont être générés par l'exploitation du pétrole soient utilisés pour le développement d'initiatives de conservation dans la zone.

Summary. We present the results of a survey undertaken in May 2008 in the Mozambican part of the Ruvuma River delta, Cabo Delgado Region. One hundred and forty-six species were observed, including nine individuals of the globally Endangered Madagascar Pond Heron *Ardeola idae* and eight of the 25 species restricted to the East African Coast biome occurring in Mozambique. Despite being still relatively well preserved, the Ruvuma Delta is highly threatened by rapidly expanding agriculture, hunting, planned oil and gas drilling, and illegal timber extraction. We suggest that part of the potentially huge incomes that will be generated by oil exploitation should be used to develop conservation initiatives in the area.

Mozambique remains one of the ornithologically least-explored parts of continental Africa. Following the civil war, which ended in 1992, improved security and political stability have enabled scientific exploration, but most of the work so far has been concentrated south of the Zambesi Delta (Parker 1999, 2005a). In northern Mozambique, ornithological knowledge is still restricted to information collected decades ago (Vincent 1933, 1934), although some small areas have been the object of more detailed studies recently (Ryan *et al.* 1999, Parker 2005b, Spottiswoode *et al.* 2008). Overall, the limited knowledge of the northern Mozambique avifauna seriously impedes conservation efforts. Only 15 Important Bird Areas have to date been recognised in the country, whereas neighbouring countries with comparable sizes and habitats have a substantially higher number (e.g. Tanzania: 76; South Africa: 101; Zambia: 31; Fishpool & Evans 2001). Thus, there are good reasons to suspect that several important sites might still be undiscovered in Mozambique, and there is an urgent need to identify these before they are irreparably damaged by the rapid expansion of human activities.

Amongst the habitats of highest conservation importance in the country are forests, where 13 of the 22 threatened or restricted-range species occur, and coastal wetlands, which are known to host important concentrations of waterbirds, but whose importance is difficult to assess due to the lack of data (Parker 2001).

Here we report the results of a short ornithological survey undertaken in the Ruvuma River delta (Cabo Delgado Region) in May 2008. This area, at the border between Mozambique and Tanzania, is occupied by a large river delta, with extensive wetlands, mangrove and coastal forest that make it potentially extremely important for conservation.

Study area

The Ruvuma Delta, at the border between Mozambique and Tanzania, is almost equally split between the two countries (Fig. 1). Satellite images taken in the year 2000 (downloaded from www.glcf.umiaccs.umd.edu) show that the Mozambican side of the delta covers c. 150 km², which includes the following six major habitats:

- **Mangrove** (c.80–90 km²) largely dominated by *Rhizophora mucronata*, which in places forms dense stands up to 20 m tall (Fig. 2). Other common species include *Avicennia marina*, *Sonneratia alba*, *Bruguiera gymnorhiza*, *Ceriops tagal* and *Xylocarpum granatum*.
- **Sandy beaches** (10–12 linear km) usually bordered by a belt of the palm *Hyphaene coriacea* along the inland side.
- **Mudflats** (15 km²) usually with a scattered cover of low *Avicennia marina* bushes.
- **Grassland/bush** (15 km²; Fig. 3); at the time of the survey (shortly after the end of the rains) this was dominated by tall grasses (1–2 m tall) with scattered bushes (*Strychnos spinosa*, *Hyphaene coriacea*, *Guetarda speciosa*, *Ochna* spp.) and trees (*Parinari curatellifolia*, *Tamarindus indica*, *Acacia* spp.). Probably this habitat is maintained by frequent dry-season fires whose traces are easy to observe.
- **Thicket/forest** (20 km²; Fig. 3), with canopy 10–20 m tall and dominated by *Brachystegia* spp., *Azelia quanzensis*, *Ozoroa obovata*, *Albizia glaberrima*, *Commiphora serrata*; the undergrowth usually comprises species such as *Rawsonia lucida*, *Erythroxylon emarginatum*, *E. platyclados*, *Suregada zanzibarica*.
- **Freshwater wetlands** (c.1 km²; Fig. 4), usually represented by small ponds (100–500 m diameter) with dense aquatic vegetation (Cyperaceae and Gramineae). According to local people, the largest of these ponds do not dry out, even in the dry season.

We spent most of the survey period on Ilha Suafo, a small, triangular-shaped island fringed by dense mangrove and with an interior of grassland and thicket/forest (Fig. 1). Ilha Suafo has a small, but rapidly growing, human population (200–400 inhabitants), which practices fishing and agriculture (rice, maize, cassava). From 6 to 17 May we camped at a site called Kasharifu (10°29'S 40°30'E), in the north of Ilha Suafo, and from 18 to 21 May at Asharati, in the south of the island. We also occasionally visited the mainland (Quionga and Namoto) but made few ornithological observations there, as we mainly searched for small mammals.

Methods

Birds were identified by their calls, visual observations and mist-netting. Boat trips were made in the mangrove channels and along the sea coast (Fig. 1), although these were impeded by strong winds. Mist-netting was undertaken at four sites (three grassland/bush and one thicket/forest) at Kasharifu and one site at Asharati (thicket/forest). At each of these 9–15 mist-nets were opened from 05.00 to 10.00 hrs and from 16.00 to 17.30 hrs. Captured birds were banded using rings of the East African ringing scheme.

Results

Birds

One hundred and forty-six species were observed (Table 1), including eight of the 25 species restricted to the East African Coast biome occurring in Mozambique (Fishpool & Evans 2001). Although the majority of the species that we observed were typical of open or aquatic habitats, we also found a substantial number of forest-dependent species, including Ayres's Hawk Eagle *Hieraaetus ayresii*, Crested Guineafowl *Guttera pucherani*, Trumpeter Hornbill *Bycanistes bucinator*, Eastern Nicator *Nicator gularis*, Blue-mantled Crested Flycatcher *Trochocercus cyanomelas* and Green Twinspot *Mandingoa nitidula*.

Table 1. Bird species recorded in the Ruvuma Delta, including information on relevant habitats utilised. Species marked with an asterisk are endemic to the East African Coastal biome (Fishpool & Evans 2001).

Tableau 1. Espèces d'oiseaux observées dans le Delta de la Ruvuma, avec indication des habitats utilisés. Les espèces marquées d'un astérisque sont endémiques au biome côtier est africain (Fishpool & Evans 2001).

Common name/Scientific name	Sandy beaches	Mangroves	Mudflats	Grassland / bush	Thicket / forest	Wetlands	Agriculture
Ardeidae							
Dwarf Bittern <i>Ixobrychus sturmii</i>							x
Madagascar Pond Heron <i>Ardeola idae</i>							x
Cattle Egret <i>Bubulcus ibis</i>			x				x
Striated Heron <i>Butorides striata</i>			x				
Dimorphic Egret <i>Egretta dimorpha</i>		x	x				
Great White Egret <i>Egretta alba</i>		x					
Goliath Heron <i>Ardea goliath</i>			x				
Scopidae							
Hamerkop <i>Scopus umbretta</i>		x	x				x

Common name/Scientific name	Sandy beaches	Mangroves	Mudflats	Grassland / bush	Thicket / forest	Wetlands	Agriculture	Common name/Scientific name	Sandy beaches	Mangroves	Mudflats	Grassland / bush	Thicket / forest	Wetlands	Agriculture
Ciconiidae								Cuculidae							
African Openbill Stork <i>Anastomus lamelligerus</i>	x				x			Jacobin Cuckoo <i>Clamator jacobinus</i>				x		x	
Woolly-necked Stork <i>Ciconia episcopus</i>	x							Klaas's Cuckoo <i>Chrysococcyx klaas</i>				x	x		
Saddle-billed Stork <i>Ephippiorhynchus senegalensis</i>	x							Didric Cuckoo <i>Chrysococcyx caprius</i>				x	x		
Threskiornithidae								White-browed Coucal <i>Centropus superciliosus</i>				x		x	
Hadada Ibis <i>Bostrychia hagedash</i>		x			x			Strigidae							
Anatidae								African Wood Owl <i>Strix woodfordii</i>		x					
White-faced Whistling Duck <i>Dendrocygna viduata</i>					x			Caprimulgidae							
Egyptian Goose <i>Alopochen aegyptiaca</i>					x			Square-tailed Nightjar <i>Caprimulgus fossii</i>				x			
Spur-winged Goose <i>Plectropterus gambensis</i>					x			Fiery-necked Nightjar <i>Caprimulgus pectoralis</i>				x			
Red-billed Teal <i>Anas erythrorhyncha</i>					x			Apodidae							
Accipitridae								Mottled Spinetail <i>Telacanthura ussheri</i>							x
Bat Hawk <i>Macheiramphus alcinus</i>				x	x			African Palm Swift <i>Cypsiurus parvus</i>							x
Black Kite <i>Milvus migrans</i>	x	x	x	x		x		Little Swift <i>Apus affinis</i>							x
African Fish Eagle <i>Haliaeetus vocifer</i>	x	x						Coliidae							
Black-chested Snake Eagle <i>Circaetus pectoralis</i>						x		Red-faced Mousebird <i>Urocolius indicus</i>				x			x
Brown Snake Eagle <i>Circaetus cinereus</i>				x	x			Alcedinidae							
Bateleur <i>Terathopius ecaudatus</i>				x	x	x		Brown-hooded Kingfisher <i>Halcyon albiventris</i>							x
African Harrier Hawk <i>Polyboroides typus</i>				x	x			Mangrove Kingfisher* <i>Halcyon senegaloides</i>		x					
African Goshawk <i>Accipiter tachiro</i>					x	x		Striped Kingfisher <i>Halcyon chelicuti</i>							x
Ayres's Hawk Eagle <i>Hieraetus ayresii</i>					x			African Pygmy Kingfisher <i>Ceyx pictus</i>						x	
Numididae								Malachite Kingfisher <i>Alcedo cristata</i>						x	
Crested Guineafowl <i>Guttera pucherani</i>					x			Pied Kingfisher <i>Ceryle rudis</i>						x	
Helmeted Guineafowl <i>Numida meleagris</i>			x					Meropidae							
Phasianidae								Little Bee-eater <i>Merops pusillus</i>				x			x
Harlequin Quail <i>Coturnix delegorguei</i>				x				Swallow-tailed Bee-eater <i>Merops hirundineus</i>				x			x
Crested Francolin <i>Francolinus sephaena</i>				x				Madagascar Bee-eater <i>Merops superciliosus</i>				x			x
Jacaniidae								Coraciidae							
African Jacana <i>Actophilomys africanus</i>						x		Lilac-breasted Roller <i>Coracias caudatus</i>					x		x
Dromadidae								Broad-billed Roller <i>Eurystomus glaucurus</i>					x		
Crab-plover <i>Dromas ardeola</i>	x							Phoeniculidae							
Recurvirostridae								Common Scimitarbill <i>Rhinopomastus cyanomelas</i>					x		
Black-winged Stilt <i>Himantopus himantopus</i>					x			Bucerotidae							
Burhinidae								Crowned Hornbill <i>Tockus alboterminatus</i>					x		x
Water Thick-knee <i>Burhinus vermiculatus</i>	x							Trumpeter Hornbill <i>Bycanistes bucinator</i>					x		
Spotted Thick-knee <i>Burhinus capensis</i>				x				Capitonidae							
Charadriidae								Yellow-rumped Tinkerbird <i>Pogoniulus bilineatus</i>		x			x		
Three-banded Plover <i>Charadrius tricollaris</i>			x					Yellow-fronted Tinkerbird <i>Pogoniulus chrysoconus</i>					x		
White-fronted Plover <i>Charadrius marginatus</i>	x	x	x					Picidae							
Greater Sand Plover <i>Charadrius leschenaultii</i>	x							Green-backed Woodpecker <i>Campethera cailliautii</i>					x	x	
Scolopacidae								Cardinal Woodpecker <i>Dendropicos fuscescens</i>					x	x	
Sanderling <i>Calidris alba</i>	x							Bearded Woodpecker <i>Dendropicos namaquus</i>					x		x
Whimbrel <i>Numenius phaeopus</i>	x	x						Alaudidae							
Terek Sandpiper <i>Xenus cinereus</i>	x	x						Flappet Lark <i>Mirafraga rufocinnamomea</i>				x			
Sternidae								Hirundinidae							
Greater Crested Tern <i>Sterna bergii</i>	x							Lesser Striped Swallow <i>Cercropis abyssinica</i>							x
Lesser Crested Tern <i>Sterna bengalensis</i>	x							Wire-tailed Swallow <i>Hirundo smithii</i>					x		x
Columbidae								Barn Swallow <i>Hirundo rustica</i>					x		x
African Green Pigeon <i>Treron calvus</i>					x			Motacillidae							
Tambourine Dove <i>Turtur tympanistria</i>					x			African Pied Wagtail <i>Motacilla aguimp</i>							x
Emerald-spotted Wood Dove <i>Turtur chalcospilos</i>				x	x			Grassland Pipit <i>Anthus cinnamomeus</i>		x		x			
Red-eyed Dove <i>Streptopelia semitorquata</i>					x	x		Woodland Pipit <i>Anthus nyassae</i>				x			x
Ring-necked Dove <i>Streptopelia capicola</i>				x	x	x		Yellow-throated Longclaw <i>Macronyx croceus</i>					x		
Psittacidae								Campephagidae							
Brown-headed Parrot* <i>Poicephalus cryptoxanthus</i>					x	x		Black Cuckooshrike <i>Campephaga flava</i>					x		

Common name/Scientific name	Sandy beaches	Mangroves	Mudflats	Grassland / bush	Thicket / forest	Wetlands	Agriculture	Common name/Scientific name	Sandy beaches	Mangroves	Mudflats	Grassland / bush	Thicket / forest	Wetlands	Agriculture
Pycnonotidae								Ploceidae							
Sombre Greenbul <i>Andropadus importunus</i>				x	x	x		Spectacled Weaver <i>Ploceus ocularis</i>					x		x
Yellow-bellied Greenbul <i>Chlorocichla flaviventris</i>					x			Yellow Weaver <i>Ploceus subaureus</i>					x	x	x
Fischer's Greenbul* <i>Phyllastrephus fischeri</i>				x	x			Village Weaver <i>Ploceus cucullatus</i>					x	x	x
Common Bulbul <i>Pycnonotus barbatus</i>				x	x	x		Thick-billed Weaver <i>Amblyospiza albifrons</i>						x	
Eastern Nicator <i>Nicator gularis</i>					x			Red-headed Quelea <i>Quelea erythrops</i>					x	x	
Turdidae								Red-billed Quelea <i>Quelea quelea</i>					x		x
Red-capped Robin Chat <i>Cossypha natalensis</i>				x	x			Zanzibar Bishop* <i>Euplectes nigroventris</i>						x	
Bearded Scrub Robin <i>Cercotrichas quadringata</i>		x		x	x	x		Black-winged Bishop <i>Euplectes hordeaceus</i>							x
Sylviidae								Yellow Bishop <i>Euplectes capensis</i>				x			
Little Rush Warbler <i>Bradypterus baboecala</i>						x		Estrildidae							
Red-faced Crombec <i>Sylvietta whytii</i>				x	x			Green Twinspot <i>Mandingoa nitidula</i>						x	
Willow Warbler <i>Phylloscopus trochilus</i>				x				Common Waxbill <i>Estrilda astrild</i>					x		x
Cisticolidae								Red-throated Twinspot <i>Hypargos niveoguttatus</i>					x	x	
Red-faced Cisticola <i>Cisticola erythrops</i>				x				Green-winged Pytilia <i>Pytilia melba</i>					x	x	x
Croaking Cisticola <i>Cisticola natalensis</i>				x				Red-billed Firefinch <i>Lagonosticta senegala</i>					x	x	x
Siffling Cisticola <i>Cisticola brachypterus</i>				x				Bronze Mannikin <i>Lonchura cucullata</i>							x
Zitting Cisticola <i>Cisticola juncidis</i>			x	x				Black-and-white Mannikin <i>Lonchura bicolor</i>							x
Tawny-flanked Prinia <i>Prinia subflava</i>				x	x	x	x	Magpie Mannikin <i>Lonchura fringilloides</i>					x		
Yellow-breasted Apalis <i>Apalis flavida</i>				x	x			Viduidae							
Green-backed Camaroptera <i>Camaroptera brachyura</i>				x	x	x		Pin-tailed Whydah <i>Vidua macroura</i>					x		x
Muscicapidae								Fringillidae							
Southern Black Flycatcher <i>Melaenornis pammelaina</i>							x	Yellow-fronted Canary <i>Seninus mozambicus</i>					x		x
Grey Tit-Flycatcher <i>Mioparus plumbeus</i>					x										
Monarchidae															
Blue-mantled Crested Flycatcher <i>Trochocercus cyanomelas</i>						x									
African Paradise Flycatcher <i>Terpsiphone viridis</i>		x		x	x										
Platysteiridae															
Black-throated Wattle-eye <i>Platysteira peltata</i>						x									
Pale Batis* <i>Batis soror</i>		x		x	x	x									
Nectariniidae															
Eastern Olive Sunbird <i>Cyanomitra olivacea</i>						x									
Grey Sunbird* <i>Cyanomitra verroxii</i>		x		x	x	x									
Scarlet-chested Sunbird <i>Chalcomitra senegalensis</i>		x		x	x	x									
Collared Sunbird <i>Hedydipna collaris</i>			x		x										
Purple-banded Sunbird <i>Cinnyris bifasciatus</i>		x		x	x	x									
Malacotidae															
Sulphur-breasted Bushshrike <i>Telophorus sulfureopectus</i>				x	x										
Gorgeous Bushshrike* <i>Telophorus viridis</i>					x										
Brown-crowned Tchagra <i>Tchagra australis</i>				x	x										
Black-backed Puffback <i>Dryoscopus cubla</i>				x	x	x									
Tropical Boubou <i>Laniarius aethiopicus</i>					x										
Prionopidae															
White Helmetshrike <i>Prionops plumatus</i>					x										
Retz's Helmetshrike <i>Prionops retzii</i>					x										
Oniidae															
Eastern Black-headed Onole <i>Onolus larvatus</i>				x	x										
Dicruridae															
Fork-tailed Drongo <i>Dicrurus adsimilis</i>					x										
Corvidae															
Pied Crow <i>Corvus albus</i>							x								
Sturnidae															
Black-bellied Starling* <i>Lamprolaima coruscus</i>		x			x										
Passeridae															
House Sparrow <i>Passer domesticus</i>							x								

Captions to figures on opposite page

Figure 2. Large expanses of healthy and relatively well preserved mangroves still characterise the Ruvuma River delta (L. Borghesio)

De grandes étendues de mangroves relativement bien préservées sont toujours caractéristiques du Delta de la Ruvuma (L. Borghesio)

Figure 3. The interior of Ilha Suafu is occupied by a mosaic of tall grassland and thicket probably maintained by seasonal fires (L. Borghesio)

L'intérieur de l'Ilha Suafu est occupé par une mosaïque de prairies et de bosquets, qui est probablement maintenue par des feux de brousse saisonniers (L. Borghesio)

Figure 4. A small wetland with dense aquatic vegetation where Madagascar Pond Heron *Ardeola idae* was observed (L. Borghesio)

Une petite zone humide à végétation aquatique dense où le Crabier blanc *Ardeola idae* a été observé (L. Borghesio)

Figure 5. Grey Sunbird / Souimanga murin *Cyanomitra verroxii* (L. Borghesio)

Figure 6. Red-faced Cisticola / Cisticole à face rousse *Cisticola erythrops* (L. Borghesio)

Figure 7. Fischer's Greenbul / Bulbul de Fischer *Phyllastrephus fischeri* (L. Borghesio)

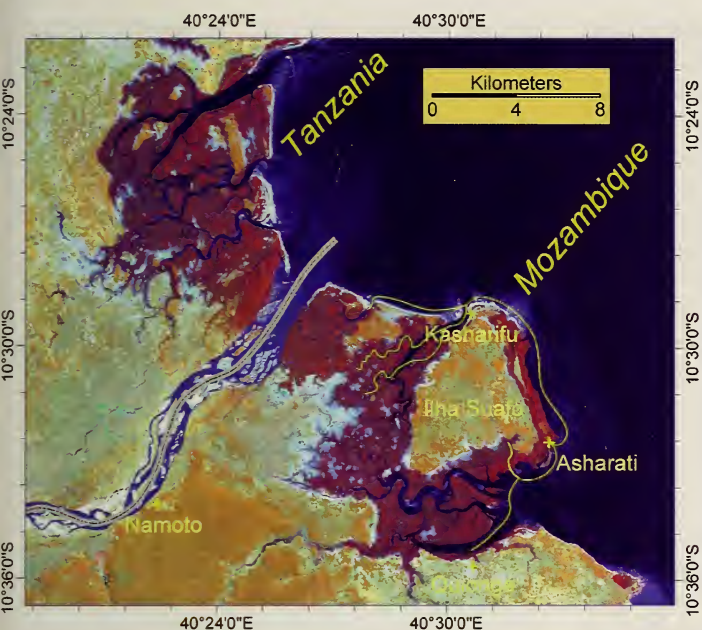


Figure 1. The Ruvuma Delta. The grey line marks the Mozambique/Tanzania border, yellow lines indicate those parts of the delta visited by boat. The false-colour image (Landsat ETM+ of May 2000) shows mangroves (deep red), sand beaches and mudflats (pale grey), thicket/low forest (orange) and grassland/bush (grey-green).

Le Delta de la Ruvuma. La ligne grise indique la frontière entre la Mozambique et la Tanzanie, les lignes jaunes indiquent les parties du delta qui ont été prospectées en bateau. L'image couleur (Landsat ETM+ de mai 2000) indique les mangroves (rouge foncé), les plages de sable et les vasières (gris pâle), les bosquets et forêts basses (orange) et les prairies et broussailles (gris-vert).



One globally threatened species, Madagascar Pond Heron *Ardeola idae* (Endangered: BirdLife International 2000, 2004) was also recorded. At least nine individuals of this non-breeding migrant to the East African coastal region were observed on 11 May 2008 in different ponds and small lakes in the interior of Ilha Suafo. As these ponds were densely vegetated, we suspect that the total number of Madagascar Pond Herons was larger than we counted. During the survey, there was no noticeable sign of breeding activity. Of 237 mist-netted individuals, only three (two Black-headed Weavers, and one Fischer's Greenbul *Phyllastrephus fischeri*) had a brood patch.

Other species

Large mammals included Leopard *Panthera pardus*, Hippopotamus *Hippopotamus amphibius* and African Elephant *Loxodonta africana*. These species appeared to be quite widespread, but very shy and difficult to observe, undoubtedly due to human disturbance. Despite specific searches, we were unable to find any signs of the Dugong *Dugong dugon*, which, according to local people, disappeared from the area during the civil war.

We recorded four nesting attempts by sea turtles (three Green Turtles *Chelonia mydas* and one Hawksbill Turtle *Eretmochelys imbricata*); all these attempts were disrupted by human interference, and the adults were killed by local fishermen in at least two cases.

Discussion

Considering the short duration and the preliminary nature of our survey, the 146 species that we observed are likely to represent only an incomplete checklist of the avifauna of the Ruvuma Delta. Moreover, the fact that our survey was made during the boreal spring did not permit us to estimate the importance of the delta as a wintering or staging site for migratory Palearctic birds. Despite this, our data reveal that the Ruvuma hosts a substantial proportion of the bird fauna of the East African Coastal biome and at least one globally threatened species. Further studies will certainly provide more evidence of the importance of this site for bird conservation, especially considering the still-low human population and vast expanses of well-preserved natural habitats. For instance, several villagers in the area indicated the pres-

ence of colonies of the Near Threatened African Skimmer *Rhynchops flavirostris*, which we were unable to locate.

Even though until recently the Mozambican side of the Ruvuma has not been subject to large-scale habitat destruction, the situation might rapidly change in the near future. We noted four main threats.

- **Oil and gas drilling.** The recent discovery of potentially important oil and gas reserves (Anadarko Petroleum Corporation 2007) will probably result in the development of large oil extraction facilities on both the Mozambican and the Tanzanian sides of the delta. At the time of our visit, the roads to Quionga and Namoto were being upgraded and broadened with funds provided by the oil companies, with much damage to the adjacent forest. It is still too early to judge the size of the environmental damage that oil extraction might cause to the Ruvuma, but the huge impacts seen in other African countries are sufficient to cause much concern.
- **Agricultural expansion.** Habitat clearance for agriculture is progressing rapidly. At Ilha Suafo, practically all of the people declared that they had moved to the island in the last few years due to increasing land scarcity on the mainland. We estimate that c.300 ha of natural vegetation (10% of available land) have been cleared on the island since 2000. Clearance was by cutting and burning the natural vegetation, and the best-developed patches of natural forest appeared to have been specifically targeted, perhaps due to their being located on more fertile soil. Although agriculture still occupies a relatively small fraction of land in the area, the rapid expansion of this activity suggests that it might become an important threat to biodiversity in the near future.
- **Hunting.** Hunting is intense in northern Mozambique, and has already caused the local extinction of the Dugong. Hunting is also a severe threat to sea turtles, whose nesting success is close to zero based on our observations, and to numerous species of mammals (duikers, bush pigs, elephant shrews). Birds are also regularly and intensively hunted, not only by adults who mainly target large birds

(guineafowl, francolins), but also by children who use catapults and small traps to capture smaller species. Most people who we met on Ilha Suafo readily admitted to eating birds regularly.

- **Proximity of the Tanzanian border.** This factor, coupled with the severe lack of personnel and equipment of the local police, contribute to making the Mozambican side of the delta a lawless area. Numerous small villages inhabited by Tanzanian fishermen are scattered through the area. These fishermen appear to engage in various illegal activities, especially the extraction of timber in the mangroves and hunting sea turtles, thus further increasing the pressure on the environment.

More scientific work is needed to ascertain the biological importance of the Ruvuma Delta. But, even more importantly, urgent action needs to be taken to counter the environmental degradation that is occurring in the area. In particular, we suggest: (1) improved patrolling and law enforcement along the border to avoid illegal exploitation of natural resources by immigrants and (2) above all, oil extraction in the area should be developed in an environmentally sustainable way, with part of the potentially huge income used to improve conservation.

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References

Anadarko Petroleum Corporation 2007. Rovuma Offshore Area. www.anadarko.com/mozambique (accessed 1 July 2008).

- BirdLife International. 2000. *Threatened Birds of the World*. Barcelona: Lynx Edicions & Cambridge, UK: BirdLife International.
- BirdLife International. 2004. *Threatened Birds of the World 2004*. CD-ROM. Cambridge, UK: BirdLife International.
- Fishpool, L. D. C. & Evans, M. I. (eds.) 2001. *Important Bird Areas in Africa and Associated Islands: Priority Sites for Conservation*. Newbury: Pisces Publications & Cambridge, UK: BirdLife International.
- Parker, V. 1999. *The Atlas of the Birds of Sul Do Save, Southern Mozambique*. Cape Town & Johannesburg: Avian Demography Unit and Endangered Wildlife Trust.
- Parker, V. 2001. Mozambique. In Fishpool, L. D. C. & Evans, M. I. (eds.) *Important Bird Areas in Africa and Associated Islands: Priority Sites for Conservation*. Newbury: Pisces Publications & Cambridge, UK: BirdLife International.
- Parker, V. 2005a. *The Atlas of the Birds of Central Mozambique*. Johannesburg & Cape Town: Endangered Wildlife Trust & Avian Demography Unit.
- Parker, V. 2005b. *The Birds of the Niassa Reserve, Mozambique*. Cape Town: Avian Demography Unit.
- Ryan, P., Spottiswoode, C., Parker, V. Graham, J. Cohen, C. & Bento, C. 1999. The birds of Namuli, northern Mozambique: retracing Vincent's footsteps. *Bull. ABC* 6: 138–143.
- Spottiswoode, C. N., Patel, I. H., Herrmann, E., Timberlake, J. & Bayliss, J. 2008. Threatened bird species on two little-known mountains (Chiperone and Mabu) in northern Mozambique. *Ostrich* 79: 1–7.
- Vincent, J. 1933–34. The birds of Northern Portuguese East Africa. Comprising a list of, and observations on, the collections made during the British Museum Expedition of 1931–32. Part I & II. *Ibis* 75: 611–652; 76: 126–160.
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